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64-10

AMENDMENT 1

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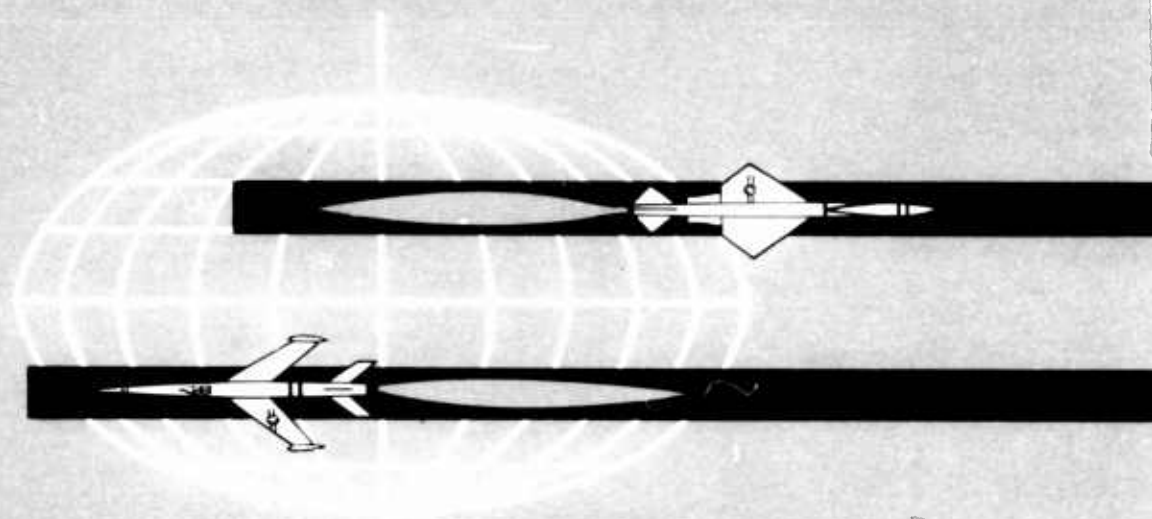
EUR-MED TROPO SYSTEM

EQUIPMENT PERFORMANCE SPECIFICATIONS

ICS-61-SPEC-101 THROUGH 112,114

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ITT COMMUNICATION SYSTEMS, INC.
PARAMUS, N.J.

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1 February 1962

so arranged that the ground connection to the ground terminals of the equipment input and output circuits is supplied externally. There shall be no metallic connection to the equipment mounting plate or chassis. The arrangement of circuit grounds shall be such as to prevent the formation of ground loops or common impedance coupling between equipments in order to meet the crosstalk requirements of paragraph 3.3.3.3.

1 February 1962

ERRATA TO
EUR-MED TROPO SYSTEM
EQUIPMENT PERFORMANCE SPECIFICATION
ICS-61-SPEC-101 THROUGH 112, 114

1. In each of the specifications noted above, the following paragraphs shall be modified as required and specified in paragraph 2 below:

X.X RELIABILITY AND MAINTAINABILITY

X.X.1 RELIABILITY.- A reliability control program shall be conducted in accordance with MIL-STD-441. Numerical reliability indices for the equipment in terms of "mean time between failures" (MTBF) compatible with system requirements shall be determined in accordance with the procedures specified in MIL-R-27070.

X.X.2 MAINTAINABILITY.- The contractor shall include as a specified area of effort, a maintainability program in accordance with the requirements of MIL-M-26512A.

2. The new paragraphs above shall be incorporated in the pertinent specification in accordance with the cross-reference chart below.

Specification
Number
(ICS-61-SPEC)

Modification

-101	Delete paragraph 3.4.2 RELIABILITY, replace with above
-102	Add above as new paragraphs 3.10, 3.10.1, and 3.10.2
-103	Delete paragraph 3.1.2 RELIABILITY, replace with above
-104	Add above as new paragraphs 3.7, 3.7.1, and 3.7.2
-105	Add above as new paragraphs 3.7, 3.7.1, and 3.7.2
-106	Delete paragraph 3.2.2 RELIABILITY, replace with above
-107	Delete paragraph 3.2 RELIABILITY, replace with above
-108	Add above as new paragraphs 3.7, 3.7.1, and 3.7.2
-109	Delete paragraph 3.2.4 RELIABILITY, replace with above
-110	Delete paragraph 3.3 RELIABILITY, replace with above
-111	Add above as new paragraphs 3.5, 3.5.1, and 3.5.2
-112	Delete paragraph 3.1.2.4 RELIABILITY, replace with above
-114	Add above as new paragraphs 3.7, 3.7.1, and 3.7.2

3. Add the following new paragraph to ICS-61-SPEC-109:

3.3.1.6 Grounding of Circuits and Equipment.- Where circuit impedances of 75 ohms are specified for input and output impedances of equipment units called for in this specification, the input and output circuits shall be

1 FEBRUARY 1962

AMENDMENT 1 TO
EUROPEAN-MEDITERRANEAN
TROPOSPHERIC SCATTER COMMUNICATION SYSTEM
EQUIPMENT PERFORMANCE SPECIFICATIONS

ITT COMMUNICATION SYSTEMS, INC.
PARAMUS, NEW JERSEY
CONTRACT NO. AF19(626)-4
ICS-61-SPEC-101 THROUGH 112, 114

PREPARED FOR
480L SYSTEM PROGRAM OFFICE
UNITED STATES AIR FORCE
L. G. HANSCOM FIELD
BEDFORD, MASSACHUSETTS

PREFACE

This amendment to Specification ICS-61-SPEC-101 through 112 and 114 reflects the status of the European-Mediterranean Tropospheric Scatter Communication System effective 1 February 1962.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-101
1 February 1962

AMENDMENT 1

MILITARY SPECIFICATION
TROPO SCATTER RADIO SET AN/FRC- ()

This amendment forms a part of Specification ICS-61-SPEC-101, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 3. REQUIREMENTS. - Add to the text, the following:

When the requirements of this specification or of MIL-R-9657B conflict with the requirements of Specification ICS-61-SPEC-100, the requirements of ICS-61-SPEC-100 shall govern.

PARAGRAPH 3.7.1.1 INTERMODULATION. - Delete the text and substitute the following:

Delete Paragraph 3.7.1.1 of MIL-R-9657B in its entirety and substitute the following:

Intermodulation of exciter, RF power amplifier, and receiver taken together shall be such that when the system is loaded with uniform noise in accordance with CCIR Recommendation 293 (Los Angeles 1959), the noise power ratio measured in any unilluminated channel located in any part of the complete baseband shall be greater than 55 db with an objective of 61 db. This requirement shall be met with the preemphasis and deemphasis networks disabled to yield a flat response and with noise loading corresponding to 132 channels in the 12 kc to 552 kc baseband. The loading shall be adjusted to provide an FM deviation per channel corresponding to a deviation of ± 200 kc rms produced by a test tone in the channel at a level of 0 dbm0.

PARAGRAPH 3.7.3 OVERALL FREQUENCY RESPONSE. - In item a., Order Wire, change "250 cps" to "300 cps".

PARAGRAPH 3.8.1.3 MODULATOR. - Change item (1) to read, "Delete b. and d."; in item (2) change "60 kc" to "12 kc"; delete item (3).

PARAGRAPH 3.8.1.3.2 DEVIATION, FM. - Before the text, add the following:

Delete Paragraph 3.8.1.3.2 of MIL-R-9657B in its entirety and substitute the following:

Change the third sentence of the text to read:

The channel deviation shall be ± 200 kc per channel with the pre-emphasis network disabled to yield a flat response.

Add the following new paragraph:

3.8.1.3.3 LEVEL INDICATOR. - Delete the text of MIL-R-9657B and substitute the following:

Means shall be provided at the input to the modulator to permit the measurement of the input level using an external indicating instrument.

PARAGRAPH 3.8.1.4 POWER MONITOR. - Delete all after "the following" and substitute:

A visual and audible alarm shall be provided to indicate failure of adequate output power from the exciter. The alarm shall be independent of the modulation alarm specified in paragraph 3.8.1.8.

PARAGRAPH 3.8.1.6 INPUT LEVEL. - Before the text, add the following:

Delete paragraph 3.8.1.6 of MIL-R-9657B and substitute the following:

PARAGRAPH 3.8.2.2 POWER OUTPUT. - Amend the VSWR requirement to read, "1.2:1".

Add the following new paragraph:

3.8.2.5 FREQUENCY RESPONSE. - Delete the text of MIL-R-9657B and substitute the following:

The RF power output of the amplifier shall be constant within 1.0 db for a frequency range of ± 2.5 mc about the nominal operating carrier frequency and shall be down not more than 3.0 db from the output at the nominal operating carrier frequency at frequencies of ± 3.5 mc from the nominal operating carrier frequency.

PARAGRAPH 3.8.2.9. - Change last line to read as follows:

Delete "external filters and diplexer" and replace with "antenna duplexing network".

PARAGRAPH 3.8.2.15 OUTPUT COUPLING. - Add to item c. "or UG-554 as applicable".

PARAGRAPH 3.8.4.8.4.1 ADJACENT CHANNEL INTERFERENCE. - Change "14 mc" to read "20 mc"; add, "with equal RF carrier inputs" between "adjacent receivers" and "at a given station".

PARAGRAPH 3.8.5.3 FREQUENCY RESPONSE, RECEIVER. - Change the tabular listing to read as follows:

	<u>Within 1 db</u>	<u>Within 3 db</u>
a.	4.2 mc	7.3 mc
b.	2.1 mc	3.5 mc
c.	1.5 mc	2.1 mc
d.	0.7 mc	1 mc

PARAGRAPH 3.8.5.10.1 COMBINING OUTPUT. - Delete the sentence beginning "The FM threshold of four", in its entirety.

PARAGRAPH 3.8.5.10.2.2 BASEBAND OUTPUT REQUIREMENTS. - In item a., change "250 cps" to "300 cps".

PARAGRAPH 3.8.5.10.3 BASEBAND OUTPUT LEVEL. - In item c., change "200 kc rms" to "100 kc rms". Add, after the tabular material:

The receiver shall be capable of accepting an input signal having a deviation of 200 kc rms and meeting the requirements of Paragraph 3.7.1.1.

PARAGRAPH 3.8.6.1 ANTENNA CONNECTIONS. - Delete this paragraph in its entirety.

PARAGRAPH 3.8.10 DUMMY LOAD AND CALORIMETER. - In item a., change the last sentence to read:

The VSWR shall be less than 1.2:1 over the operating bandwidth.

PARAGRAPH 3.8.11.1 DEHYDRATOR. - Insert the following after the third sentence:

The dehydrator shall be capable of pressurizing each waveguide run with a maximum leakage rate of 0.5 cubic foot per hour per waveguide section.

PARAGRAPH 3.8.11.3 DEHYDRATION. - Change -46°C to -40°C

PARAGRAPH 4. QUALITY ASSURANCE PROVISIONS. - Delete the text and substitute the following:

As specified in MIL-R-9657B with the following exceptions and additions.

4.1. After the word, "Government", add, "or designated contractor".

4.5.3 PERFORMANCE TESTS. - Delete item c., Power Diplexer, and all items listed under it.

4.5.4 ENVIRONMENTAL TESTS. - Delete all paragraphs under 4.5.4 and substitute the following:

4.5.4 ENVIRONMENTAL TESTS. - The contractor shall prepare and submit to the procuring agency for approval test procedures and test limits which shall be sufficiently comprehensive to ensure proper operation when installed in the geographic area covered by the EUR-MED Tropo System. Proper considerations shall be given to hazards in transportation and installation in preparing the subject procedures. Delete paragraphs 4.5.5, 4.5.6, 4.5.8, and 4.6 in their entirety.

MILITARY SPECIFICATION
ANTENNA GROUPS AN/FRA-(), AND ACCESSORIES

1. SCOPE

This specification supersedes and replaces Specification ICS-61-SPEC-102, dated 8 December 1961.

This specification forms a part of ICS-61-SPEC-100 and covers three types of forward propagation tropospheric scatter antenna groups for universal fixed station application. The Antenna Groups shall be a modification of Antenna Groups AN/FRA-40(), OA-1460()/FRC-39 and AN/FRA-32() specified in MIL-A-26429A, with Amendment 1, dated 5 October 1959.

1.1 MODIFICATION

Antenna Groups AN/FRA-40(), OA-1460()/FRC-39 and AN/FRA-32() and their accessories are modified herein to make them compatible with the specific performance objectives of the European-Mediterranean Tropospheric Scatter Communication System (EUR-MED Tropo System). Paragraphs of MIL-A-26429A not specifically referenced herein shall remain in force.

2. APPLICABLE DOCUMENTS

2.1 In addition to the documents cited in MIL-A-26429A, the following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein.

SPECIFICATIONS

ICS-61-SPEC-100	Performance Specification, European-Mediterranean Tropospheric Scatter Communication System
ICS-61-SPEC-101	Military Specification, Tropo Scatter Radio Set AN/FRC-()
ICS-61-SPEC-103	Performance Specification, Antenna Duplexing Network
ICS-61-SPEC-104	Performance Specification, Waveguide for Tropo Scatter Equipment Installation

2.2 OTHER PUBLICATIONS

As specified in MIL-A-26429A.

3. REQUIREMENTS

The specified requirements of MIL-A-26429A apply as requirements of this specification. Where the requirements of this specification and

MIL-A-26429A conflict, the requirements of this specification shall govern. Where the requirements of this specification and ICS-61-SPEC-100 conflict, the requirements of ICS-61-SPEC-100 shall govern. Only exceptions and additions to MIL-A-26429A shall be delineated in this specification.

The paragraph numbering of Specification MIL-A-26429A is duplicated in this specification for easy reference. Any reference to MIL-A-26429A shall include Amendment 1 dated 5 October 1959.

3.2 COMPONENTS

As specified in MIL-A-26429A with the following addition and exceptions.

3.2.1 As specified in MIL-A-26429A except only one each of either Item 8, Item 9, or Item 9 modified for 2550-2700 mc operation shall be used. Delete Item 11.

3.2.2 As specified in MIL-A-26429A except only one each of either Item 5, Item 6, or Item 6 modified for 2550-2700 mc operation shall be used. Delete Item 4.

3.2.3 As specified in MIL-A-26429A except only one each of either Item 5, Item 6, or Item 6 modified for 2550-2700 mc operation shall be used. Delete Item 4.

3.3 GENERAL SPECIFICATION

As specified in MIL-A-26429A with the following additions and exceptions.

3.3.1 SERVICE CONDITIONS (CLIMATIC). - As specified in MIL-A-26429A except delete items a. and b. and substitute the following:

a. Climate: The antenna groups shall be capable of operating in the most severe climatic conditions anticipated at the proposed European-Mediterranean site locations cited in ICS-61-SPEC-100.

b. Wind and Ice: Outdoor components shall withstand ice loading due to 2 inches radial ice (specific gravity 0.5) and winds up to 125 miles per hour (mph), simultaneously.

3.4 NOMENCLATURE

As specified in MIL-A-26429A.

3.5 DESIGN AND CONSTRUCTION

As specified in MIL-A-26429A with the following additions and exceptions.

3.5.4 WIND LOAD. - Delete the text of paragraph 3.5.4 in MIL-A-26429A and substitute the following:

A wind pressure of 66 pounds per square foot (psf) on flat surfaces and 44 psf on cylindrical surfaces shall be assumed for the 125 mph wind specified in paragraph 3.3.1. Wind loading shape factors shall be subject to the approval of the procuring activity.

3.5.5 ORIENTATION ADJUSTMENTS. - Delete the text of paragraph 3.5.5 in MIL-A-26429A and substitute the following:

When the antenna group is properly installed, it shall be possible to adjust the azimuth and elevation position over the ranges specified in Table 102-I. Precision of these adjustments shall be plus or minus 0.2 of the half-power beamwidth of the antenna if the half-power beamwidth is 0.5 degree or less and shall be plus or minus 0.1 degree if the half-power beamwidth exceeds 0.5 degrees. Locking adjustments shall be provided for azimuth and tilt. Index markings shall be provided and shall be legible throughout the life of the structure and shall read accurately when the antenna is in any position.

3.5.10 COUPLING. - As specified in MIL-A-26429A except in line four of item a. delete "3.7.1" and substitute "Table 102-I". In items a. and b. delete the words "or Coaxial Transmission Line". In item b. correct "EIA standard, Waveguide" to read "EIA Standard Waveguide".

3.6 DETAIL REQUIREMENTS

As specified in MIL-A-26429A with the following additions and exceptions.

3.6.1 CHARACTERISTICS. - As specified in MIL-A-26429A except delete "table I" and substitute "Table 102-I".

Note: Table 102-I, ICS-61-SPEC-102, replaces Table I, MIL-A-26429A.

3.7 PERFORMANCE

As specified in MIL-A-26429A with the following additions and exceptions.

3.7.1.1 FREQUENCY RANGE. - Delete the text of paragraph 3.7.1.1 in MIL-A-26429A and substitute the following:

The frequency range shall be in the 775-985 megacycles (mc), 1700-2400 mc or 2550-2700 mc bands. Exact frequency shall be supplied by the Procuring Agency. (See paragraph 6.2.)

TABLE 102-I
ANTENNA REQUIREMENTS

Characteristics	Type I	Type II	Type III
Reflector Size (diameter of circle circumscribed)	28-30 ft nominal	60 ft nominal	120 ft nominal
Focal Length	9 ft nominal	25 ft nominal	40 ft nominal
Maximum Half-power Beam-width (3 db point in degrees)			
755 mc	3.0°	1.42°	.71°
985 mc	2.4°	1.12°	.56°
1700 mc	1.40°	.65°	.33°
2400 mc	.98°	.46°	.23°
2550 mc	.93°	.45°	.23°
2700 mc	.88°	.43°	.22°
Gain over an Isotropic Radiator (db)			
755 mc	34.5	41.0	47.0
800 mc	35.0	41.5	47.5
900 mc	36.0	42.5	48.5
985 mc	36.7	43.4	49.5
1700 mc	41.5	48.0	54.0
1850 mc	42.2	48.9	54.7
2000 mc	42.9	49.5	55.5
2250 mc	44.0	50.5	56.5
2400 mc	44.5	51.1	57.0
2550 mc	45.0	51.5	57.5
2600 mc	45.2	51.7	57.7
2700 mc	45.5	52.0	58.0
Power Capability (kw)	10	10	10
Reflector Supporting Structures	Tower AB-452()/ FRC-39 or integral ground mounted	Integral ground mounted	Integral ground mounted
Height Lower Edge of Reflector to Foundation	9 ft, lower edge of reflector be- low top of tower, or 5 ft if ground mounted	5 ft	5 ft
Orientation Adjustment: Total beam azimuth adjustment	±5°	±3°	±3°
Total beam elevation adjustment	±5°	±3°	±3°
Feedhorn Support	Attached to re- flector	Attached to re- flector or sep- arate tower mounted	Separate tower mounted

3.7.1.3 VOLTAGE STANDING WAVE RATIO. - Delete the text of paragraph 3.7.1.3 in MIL-A-26429A and substitute the following:

The antenna group voltage standing wave ratio (VSWR) as seen from the transmitter terminals shall be 1.1 to 1 or less over an 8 megacycle portion of the nominal range as specified by the procuring agency. Likewise as seen from the receiving terminals, the VSWR shall be 1.1 to 1 or less over an 8 mc portion of the nominal range as specified by the procuring agency.

3.7.1.5 GROUNDING AND LIGHTNING ARRESTER EQUIPMENT. - The vendor shall furnish adequate grounding and lightning arrester equipment and hardware for the reflector supporting structure and feedhorn support. A rod or metal member projecting at least 12 feet above the highest part of the structure shall be provided for lightning protection. All structures shall be bonded and grounded to provide a resistance to ground of not over 25 ohms.

3.7.1.6 RADIATION HAZARD AREA PROTECTION. - Radiation hazard area protection as specified in paragraph 3.8.3 of ICS-61-SPEC-100 shall be provided where required.

3.7.1.7 OBSTRUCTION LIGHTING. - An obstruction lighting kit, conforming to the requirements of the International Civil Aviation Organization, shall be provided as an accessory to be installed as required by the Procuring Agency.

3.8 DETAILS OF COMPONENTS

As specified in MIL-A-26429A with the following additions and exceptions.

3.8.1 ANTENNA REFLECTOR. - Delete the text of paragraph 3.8.1 in MIL-A-26429A and substitute the following:

The reflecting surface shall be a paraboloid with a focal length as specified in Table 102-I. The front elevation may be a circle, a square, or any polygon circumscribing a circle of nominal diameter perpendicular to its axis as specified in Table 102-I. At the highest operating frequency, the surface shall not vary from the theoretical paraboloid by more than plus or minus $1/13$ wavelength from the center out to a radius equal to $1/2$ of the total circumscribed radius nor more than plus or minus $1/8$ wavelength over the remainder of the surface under the no load conditions specified in paragraph 3.3.1.a. In addition, several sets of fair samplings, each consisting of a minimum of 300 points along a radial section

from the center of the antenna out, shall be used to measure the variation of the surface from the theoretical paraboloid under maximum operational load conditions specified in paragraph 3.3.1. The root-mean-square value of all variations along a radial section shall be less than 1/16 of a wavelength at the highest operating frequency. If necessary, provisions shall be included in the design of the reflector surface to permit field alignment of the structural members in order to meet the paraboloid contour requirements of this paragraph.

3.8.1.1 PERFORATIONS. - Delete the text of paragraph 3.8.1.1 in MIL-A-26429A and substitute the following:

Perforations, if deemed necessary, shall have an opening size appropriate for a radio frequency (RF) range from 755 to 985 mc, from 1700 to 2400 mc or from 2550 to 2700 mc.

3.8.2 HORN WAVEGUIDE AT-758 () /FRC-39 AND AT-778 () /FRC-56. - As specified in MIL-A-26429A except add "AT-778 () /FRC-56 MODIFIED FOR 2550-2700 MC OPERATION" to the paragraph title.

3.8.2.1 HORN ASSEMBLY. - Delete the text of paragraph 3.8.2.1 in MIL-A-26429A and substitute the following:

Every antenna shall be provided with a dual-polarized waveguide feed-horn. Twin waveguides, with all associated fittings and hangers, shall be provided for the dual run between the horn and the lower edge of the reflector or base of the feedhorn support tower.

3.8.2.1.1.1 POLARIZATION. - Delete the text of paragraph 3.8.2.1.1.1 in MIL-A-26429A and substitute the following:

The feedhorn shall be capable of radiating energy in either the vertical or horizontal plane of polarization. Separate transmission line feeds shall be provided for each polarization.

3.8.2.1.1.2 REFLECTOR ILLUMINATION. - As specified in MIL-A-26429A except delete "3.7.1.4" and substitute "3.7.1.2".

3.8.2.1.1.3 ISOLATION. - Delete the text of paragraph 3.8.2.1.1.3 in MIL-A-26429A and substitute the following:

The isolation between horizontal and vertical inputs in the feed-horn shall be greater than 30 db over the specified 755 to 985 mc,

1700 to 2400 mc or 2550 to 2700 mc frequency band. This isolation shall be 45 db or more over an 8 mc portion of the band to be specified by the Procuring Agency.

3.8.2.1.1.4 POWER CAPABILITIES. - Delete the text of paragraph 3.8.2.1.1.4 in MIL-A-26429A and substitute the following:

The waveguide and horn assembly shall be designed for RF power output as specified in Table 102-I at the frequency specified for the system for both horizontal and vertical polarization.

3.8.2.1.1.5 VOLTAGE STANDING WAVE RATIO. - Delete the text of paragraph 3.8.2.1.1.5 of MIL-A-26429A and substitute the following:

The VSWR at the input terminals of the feedhorn assembly shall not exceed 1.2 to 1 over any specified 98 mc portion of the specified 755 to 985 mc, 1700 to 2400 mc or 2550 to 2700 mc frequency band, nor shall it exceed 1.05 to 1 over any 8 mc portion of the 755 to 985 mc, 1700 to 2400 mc or 2550 to 2700 mc band specified by the Procuring Agency.

3.8.2.1.1.6 INPUT CONNECTIONS. - Delete the text of paragraph 3.8.2.1.1.6 in MIL-A-26429A and substitute the following:

The input terminals of the feedhorn shall consist of standard waveguide flanges.

3.8.2.1.2.1 PRESSURIZATION. - As specified in MIL-A-26429A except delete "5 pounds" and substitute "1 pound".

3.8.2.1.2.2 ANTI-ICING. - Delete the text of paragraph 3.8.2.1.2.2 in MIL-A-26429A and substitute the following:

Feedhorns associated with antenna installations exposed to icing conditions shall be provided with anti-icing means to prevent aperture blockage and beam distortion or tilt. Design shall be such as to prevent water from being trapped in the feedhorns. Single phase, 120 volt, 50 or 60 cps power may be used.

3.8.3.4 ADJUSTMENTS. - Delete the text of paragraph 3.8.3.4 in MIL-A-26429A and substitute the following:

The feedhorn shall be adjustable so that the horn may be moved for final vertical and horizontal alignment of the beam as indicated in Table 102-I.

3.8.4 TRANSMISSION LINE SYSTEM. - As specified in MIL-A-26429A except delete so much of lines two and three as read "coaxial transmission line or".

3.8.4.1 HARDWARE. - Delete the text of paragraph 3.8.4.1 in MIL-A-26429A and substitute the following:

Each section of waveguide shall be supplied with sufficient hardware to connect it to the next section.

3.8.5 PRESSURIZING EQUIPMENT AND DEHYDRATION. - Delete the text of paragraph 3.8.5 in MIL-A-26429A and substitute the following:

A system will be provided for dehydrating and pressurizing the waveguide feed lines from the RF patching panel to and including the antenna feedhorn. This equipment will be provided as required by Specification ICS-61-SPEC-101. In order for the system to maintain a required pressurization of 0.25 psi, the leakage for each section of waveguide shall be less than 0.5 cubic feet per hour.

3.8.6 SUPPORT, ANTENNA REFLECTOR AB-523()/FRC AND SUPPORT, ANTENNA REFLECTOR AB-535()/FRC. - As specified in MIL-A-26429A except delete reference to paragraph "3.7.1" and substitute "Table 102-I".

3.8.6.1 ANTENNA CONNECTIONS. - The runs of waveguide from the feedhorn to the base of the tower shall conform to the requirements of Specification ICS-61-SPEC-104.

4. QUALITY ASSURANCE PROVISIONS

As specified in MIL-A-26429A with the following additions and exceptions.

4.2 CLASSIFICATION OF TESTS

As specified in MIL-A-26429A except delete so much of line three as reads "See 4.2" and substitute "See 4.3".

4.3 ACCEPTANCE TESTS

As specified in MIL-A-26429A except delete so much of line two as reads "4.4" and substitute "4.5".

4.5.3.1 PRINCIPAL PLANE PATTERNS. - As specified in MIL-A-26429A except delete reference to "755-985 and 1700-2400 mc" and substitute "755-985 mc, 1700-2400 mc or 2550-2700 mc".

4.5.3.2 VOLTAGE STANDING WAVE RATIO AND ATTENUATION. - As specified in MIL-A-26429A except delete "755-985 mc and 1700-2400 mc" and substitute "755-985 mc, 1700-2400 mc or 2550-2700 mc".

4.5.7.3 As specified in MIL-A-26429A except delete reference to paragraph "4.5.8" and substitute "4.5.7".

4.5.8 COMPRESSOR DEHYDRATOR TEST. - Delete paragraph 4.5.8 of MIL-A-26429A in its entirety.

4.5.9 ENVIRONMENTAL TESTS. - As specified in MIL-A-26429A with the following additions and exceptions.

4.5.9.2 As specified in MIL-A-26429A except correct title to read "SHOCK AND VIBRATION".

5. PREPARATION FOR DELIVERY. - As specified in MIL-A-26429A with the following additions and deletions.

5.1 PREPARATION FOR SHIPMENT. - As specified in MIL-A-26429A except delete second sentence.

6. NOTES

As specified in MIL-A-26429A.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-103
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
ANTENNA DUPLEXING NETWORK

This amendment forms a part of Specification ICS-61-SPEC-103, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 1.0 SCOPE. - Add following to fifth sentence: "and possibly a low pass filter." Add following to last sentence: "and will also attenuate certain harmonic outputs from the transmitter."

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS, ALTERNATIVES AND PROCEDURES. - Delete the text and substitute the following:

In the event of conflict between this and any referenced military specification, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

PARAGRAPH 3.2.1 GENERAL. - In the third sentence after the word, "in-line" insert the words, "band pass". After the third sentence, insert the following:

A waveguide low pass filter may be added to the design in order to fully meet the requirements of paragraph 3.3.5.5.

PARAGRAPH 3.2.4.1 FLANGES AND TRANSMISSION LINES. - Change "UG-430A/U or" to "UG-553/U or UG-554/U". Add following sentence:

The waveguide material shall be as specified by the procuring agency.

PARAGRAPH 3.2.4.2 TRANSITIONS. - Change "UG-430A/U" to "UG-553/U or UG-554/U".

PARAGRAPH 3.3.3 PASS-REJECT FREQUENCY SEPARATION. - Delete the text and substitute the following:

Frequency separation between transmit and receive frequencies shall be as specified by the Procuring Agency.

PARAGRAPH 3.3.4 POWER RATING. - Delete reference to "50 kw".

PARAGRAPH 3.3.5.1. - Add the following to the sentence:

. . . for an operating transmitted power of 10 kw and shall be at least 30 db over a ± 5 mc band centered about the transmitting frequency for an operating transmitted power of 1 kw.

PARAGRAPH 3.3.5.3. - Add the following to the sentence:

. . . for an operating transmitted power of 10 kw and shall be at least 40 db over a ± 5 mc band centered about the receiving frequency for an operating transmitted power of 1 kw.

Add the following new paragraph:

3.3.5.5 The attenuation at the second harmonic of the transmitting frequency from the transmitter terminal to the antenna terminal shall be at least 40 db. The attenuation at the third harmonic from the transmitter terminal to the antenna terminal shall be at least 30 db.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-104
1 February 1962

AMENDMENT 1

PERFORMANCE SPECIFICATION
WAVEGUIDE FOR TROPO SCATTER EQUIPMENT INSTALLATION

This amendment forms a part of Specification ICS-61-SPEC-104, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS, ALTERNATIVES AND PROCEDURES. - Delete the text and substitute the following:

In the event of conflict between this and any referenced specification, other than ICS-61-SPEC-100, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

PARAGRAPH 4.2 ACCEPTANCE TESTS. - In item c, change "1.15:1" to "1.1:1".

PARAGRAPH 5.1 PREPARATION FOR DELIVERY. - In the first sentence change "hardwave" to "hardware".

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-105
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
RECEIVING PRESELECTION FILTER NETWORK

This amendment forms a part of Specification ICS-61-SPEC-105, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS ALTERNATIVES AND PROCEDURES. -
Delete the text and substitute the following:

In the event of conflict between this and any referenced military specification, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

AMENDMENT 1
PERFORMANCE SPECIFICATION
LINE-OF-SIGHT MICROWAVE EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-106, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS, ALTERNATIVES AND PROCEDURES. - Delete the text and substitute the following:

In the event of conflict between this and any referenced military specification, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

PARAGRAPH 3.1 COMPONENTS. - Delete items c. and d., and substitute the following: "c. Waveguide assembly (See paragraph 3.4.3)".

PARAGRAPH 3.4.1.6 MODULATION CHARACTERISTICS. - Change "250 cps" to "300 cps".

Add the following new paragraph:

3.4.3 WAVEGUIDE ASSEMBLY. - The waveguide assembly shall consist of a receiver section of transmission line, a transmitter section of transmission line and a branching filter interconnecting the receiver and transmitter line sections with the antenna waveguide run. The receiver line section shall interconnect the radio receiver and the branching filter, and the transmitter line section shall interconnect the branching filter and the radio transmitter. The branching filter shall contain phase shifters or other means which will permit the radio transmitter and receiver to function independently by directing received energy to the antenna waveguide run. All waveguide and flanges used in the Waveguide Assembly shall conform to EIA Standards TR-108 and RS-166.

Change the following paragraph numbers as indicated:

<u>Paragraph</u>	<u>Title</u>	<u>New Paragraph No.</u>
3.4.3	Branching Filter	3.4.3.1
3.4.3.1	Isolation	3.4.3.1.1
3.4.3.2	Receive Path	3.4.3.1.2
3.4.3.3	Transmit Path	3.4.3.1.3

<u>Paragraph</u>	<u>Title</u>	<u>New Paragraph No.</u>
3.4.3.4	Antenna Port	3.4.3.1.4
3.4.4	Transmission Line Group	3.4.3.2
3.4.4.1	Pressurizing Equipment and Dehydration	3.4.3.2.1
3.4.4.2	Coaxial Lines	3.4.3.2.2
3.4.4.3	Waveguide to Coaxial Transitions	3.4.3.2.3

PARAGRAPH 3.4.4.2 COAXIAL LINES. - Change the title to, "Transmission Lines".

PARAGRAPH 3.4.4.4 WAVEGUIDE ASSEMBLY. - Delete the paragraph in its entirety.

PARAGRAPH 3.4.5 LOS DIVERSITY AND STANDBY OPERATION. - Delete and substitute the following:

3.4.5 LOS DIVERSITY OPERATION. - Each terminal of all line-of-sight radio links shall be arranged for dual space diversity operation using frequency marking. Two transmitters shall be employed at each terminal each operating on a separate frequency. The modulators of the two transmitters shall be so interconnected that the multiplex band input signals modulate both transmitters simultaneously. The interconnecting circuits shall be so arranged that removal of one transmitter from the circuit for maintenance or repair does not substantially alter the signal level applied to the input of the other modulator. The circuit shall be so arranged as to minimize the effects of faults in one modulator input circuit or its connecting wiring upon the signal level applied to the other modulator.

Two receivers shall be supplied at each terminal each operating on a frequency corresponding to one of the frequencies transmitted from the distant terminal. The outputs of these receivers shall be combined as specified in Paragraph 3.4.2.4. The combined output shall form the radio receiver output to feed the multiplex and order wire equipment.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-107
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
LINE-OF-SIGHT MICROWAVE ANTENNA

This amendment forms a part of Specification ICS-61-SPEC-107, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS ALTERNATIVES AND PROCEDURES. -
Delete the text and substitute the following:

In the event of conflict between this and any referenced military specification this specification shall govern. If any conflict exists between this specification and ICS-61-SPEC-100, the latter shall govern.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-108
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
WAVEGUIDE FOR LINE-OF-SIGHT EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-108, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS ALTERNATIVES AND PROCEDURES. -
Delete the text and substitute the following:

In the event of conflict between this and any referenced specification, except ICS-61-SPEC-100, this specification shall govern. If in the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

AMENDMENT 1
PERFORMANCE SPECIFICATION
TELEPHONE MULTIPLEXER SET

This amendment forms a part of ICS-61-SPEC-109, dated 8 December 1961.
The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS, ALTERNATIVES, AND PROCEDURES. -
Delete the text and substitute the following:

In the event of conflict between the requirements of this specification and the requirements of any military specification referenced herein, the requirements of this specification shall govern. In the event of conflict between the requirements of this specification and ICS-61-SPEC-100, the requirements of ICS-61-SPEC-100 shall govern.

PARAGRAPH 3.3.2 CHANNEL TRANSLATING EQUIPMENT. - Add the following sentence to the text:

A channel translating equipment group is defined as the assembly of 12-channel translating equipments required to produce the basic 12-channel 60 to 108 kc group.

PARAGRAPH 3.3.2.3 FREQUENCY RESPONSE. - Delete the text and substitute the following:

The attenuation versus frequency response of each channel measured from audio input to audio output with the equipment looped at the Group Access Frame shall fall within the following limits referred to the attenuation at 1000 cps:

Between 600 and 2400 cps: +1.0 to -1.0 db
Between 400 and 3000 cps: +2.0 to -1.0 db
Between 300 and 3400 cps: +4.0 to -1.0 db

The average of the attenuation as frequency responses for the 12 channels provided by a channel translating equipment group shall fall within the following limits referred to the attenuation at 1000 cps:

Between 600 and 2400 cps: +0.7 to -0.7 db
Between 400 and 3000 cps: +1.5 to -0.7 db
Between 300 and 3400 cps: +3.0 to -0.7 db

PARAGRAPH 3.3.2.6 IMPEDANCES. - In item b., delete the last sentence and substitute the following:

This limit shall apply with the circuits adjusted for the normal levels specified in paragraph 3.3.2.12b.

Delete item c. in its entirety.

PARAGRAPH 3.3.2.7 GROUP DELAY DISTORTION. - Delete the entire paragraph and substitute the following:

3.3.2.7 Envelope Delay Distortion. - The envelope delay distortion of the channel translating equipment measured on each channel with the equipment looped at the GDF shall not exceed 200 microseconds between 800 and 2800 cps. It shall be permissible for the supplier to provide delay equalizing networks external to the channel translating equipment in order to conform to this requirement.

PARAGRAPH 3.3.2.10 NON-LINEAR DISTORTION. - Change "+17 dbm" to "+14 dbm".

PARAGRAPH 3.3.2.11 CHANNEL SIGNALING. - Delete the last two sentences and substitute the following:

The sensitivity of the receiver shall be such as to permit operation with an input signal of -30 dbm0. The selectivity and time constant of the signaling receiver shall be such as to minimize interference from speech or noise currents or spurious products such as carrier leaks and incompletely suppressed regulating pilot signals. The signaling equipment shall be capable of transmitting supervisory signals at rates up to 14 pulses per second.

a. Modulation. - Modulation of the transmitted signal shall be by means of "on-off" amplitude keying. In the "off" condition, the level of the signal tone transmitted shall be reduced below the level transmitted during the "on" condition by not less than 50 db. The input signals modulating the signaling tone shall be -48 volts dc for the "tone on" condition and ground for the "tone off" condition.

b. Output Signals. - The output signals delivered to the external equipment by the receiving circuit shall consist of operation of a set of Form C (break-make) contacts with the external signal (E) lead wired to the armature contact. The normally closed and open contacts shall be brought out to external connections.

Add the following new paragraph:

3.3.2.12 Levels

(a) The channel translating equipment shall be designed for normal operation with an input level of -16 dbr at the four-wire input of the modulator and +7 dbr at the four-wire output of the demodulator.

(b) The design of the channel translating equipment shall be such that the basic group levels as they appear at the group distribution frame shall be -37 dbr transmitting and -8 dbr receiving.

PARAGRAPH 3.3.3.4 NOISE. - Delete the text and substitute the following:

With the group translating equipment looped at the supergroup distributing frame (SDF), the total noise in any slot corresponding to a voice frequency channel including intermodulation noise under noise loading conditions simulating busy hour traffic loading of the group shall not exceed 70 picowatts, psophometrically weighted at a point of zero relative level. The noise in the absence of any noise loading of the group shall not exceed 25 picowatts psophometrically weighted at a point of zero relative level.

The noise power used for excitation of the illuminated channels shall be -13.4 dbm0 corresponding to the loading specified for 120-channel systems in CCIR Recommendation 293 (Los Angeles 1959).

PARAGRAPH 3.3.6 PATCHING AND DISTRIBUTION FACILITIES. - Delete all after the first sentence. Delete paragraphs 3.3.6.1, 3.3.6.2, 3.3.6.3, 3.3.6.4, 3.3.6.5, 3.3.6.6 and all subparagraphs thereto in their entirety and substitute the following:

3.3.6.1 Group Distribution and Access Frames. - The Group Distribution Frame (GDF) shall provide terminating and interconnecting facilities for those output and input circuits of the group translating equipment and channel translating equipment operating in the basic group frequency spectrum of 60 to 108 kc, and for through group filters, group pilot regulators, and transmitting and receiving group adaptors where required for interconnection with other communication systems. The terminations provided shall be on coaxial jack circuits and arranged for accomplishing the required interconnections by means of coaxial U-links. The coaxial U-links shall be so arranged with test access points that test equipment may be connected to the circuit on a bridging basis without causing circuit interruption. The Group Access Frame (GAF) shall consist of that portion of the Group Distribution Frame at which the combined 12 channel outputs and inputs of the channel translating equipment, the output circuits of group pilot regulating equipment, and the terminals of the through group filters are terminated.

3.3.6.2 Supergroup Distribution Frame. - The Supergroup Distribution Frame (SDF) shall provide terminating and interconnecting facilities for those output and input circuits of supergroup translating equipment and group translating equipment operating in the basic supergroup spectrum of 312 to 552 kc and for through supergroup filters where required. Termination shall be provided on coaxial jack circuits and arranged for accomplishing the required interconnections by means of coaxial U-links. The coaxial U-links shall be so arranged with test access points that test equipment may be connected to the circuit on a bridging basis without causing circuit interruption.

3.3.6.3 High Frequency Repeater Distribution Frame. - The High Frequency Repeater Distribution Frame (HFRDF) shall provide terminating and interconnecting facilities for the "line" side of supergroup translating equipment and for the transmitter input and receiver output circuits of the line-of-sight or tropospheric scatter radio equipment providing the transmission medium between stations, all of which operate in the multiplex band of 12 to 552 kc. The terminations provided shall be on coaxial jack circuits and arranged for accomplishing the required interconnections by means of coaxial U-links. The coaxial U-links shall be so arranged with test access points that test equipment may be connected to the circuit on a bridging basis without causing circuit interruption.

3.3.6.3.1 Hybrid Coil Set. - When specified in the bid request and contract, the manufacturer shall provide as part of the High Frequency Distribution Frame, hybrid coil sets to permit two supergroups from separate sources to be combined into one common multiplex band for transmission purposes and to provide, in the receiving path, isolation between two supergroup translators which obtain their inputs from a common multiplex band source. The hybrid coils shall conform to the following requirements.

a. Impedance. - The impedance of all four parts shall be 75 ohms unbalanced. With three parts terminated on 75 ohms ± 1 percent resistance the return loss of the impedance of the fourth part shall be not less than 20 db against a 75 ohm resistive impedance over the frequency band 60 to 552 kc.

b. Insertion Loss. - The insertion loss between any part and either of the two non-conjugate parts with all parts terminated in 75 ohms resistance shall not exceed 5 db. The variation in insertion loss over the 60 to 552 kc band shall not exceed 0.5 db.

c. Internal Balance. - The insertion loss between any part and its conjugate part with the other two parts terminated in matched resistances of 75 ohms ± 1 percent and matched to within 0.01 percent of each other shall not be less than 30 db over the frequency range 60 to 552 kc.

Add the following new paragraphs:

3.3.8 THROUGH GROUP AND SUPERGROUP WORKING. - Specification ICS-61-SPEC-100 requires the provision of through group or through supergroup working. The interconnection of the groups or supergroups shall be made by means of through group or through supergroup filters. The through group and through supergroup filters shall conform to the following requirements.

3.3.8.1 Through Group Filter. - The through group filter shall define the group spectrum and eliminate spurious frequencies lying outside the 60 to 108 kc band from the through group interconnection. The requirements of the filter are as follows:

a. Impedance. - The return loss of the filter shall be at least 20 db with the filter terminated in a resistive impedance of 75 ohms ± 1 percent at all frequencies in the range 60.175 kc to 107.70 kc.

b. Insertion Loss. - The insertion loss of the filter with its associated attenuation pads shall be 29 ± 0.5 db at 84 kc.

c. Pass Band Insertion Loss. - Except as modified in paragraph 3.3.8.1d, the spread of the insertion loss of the filter shall not exceed 0.5 db over the range 60.6 to 107.7 kc. Over the ranges corresponding to a normal 4 kc voice frequency channel, i.e., 60.6 to 63.7 kc, 64.6 to 67.7 kc, etc. through 104.6 kc to 107.7 kc, the spread shall not exceed 0.25 db. The insertion loss at 60.175 kc shall not exceed the insertion loss at 63.0 kc by more than 1.7 db.

d. Spurious Peaks of Insertion Loss in the Pass Band. - Any peaks of insertion loss occurring in the pass band due to spurious responses of crystal resonators shall fall outside the limits of the nominal 4 kc voice frequency channels specified in 3.3.8.1c. Such peaks shall not be included when determining the insertion loss versus frequency response over the range 60.6 to 107.7 kc.

e. Stop Band Characteristics. - The insertion loss of the filter relative to the insertion loss at 84.0 kc shall conform to the following limits:

- (1) At frequencies up to and including 36 kc and at frequencies of 144 kc and greater, the relative insertion loss shall not be less than 70 db.
- (2) At frequencies between 36 and 48 kc and between 132 and 144 kc, the relative insertion loss shall not be less than 87 db.
- (3) At frequencies between 48 kc and 59.7 kc, and between 108.6 kc and 132 kc, the relative insertion loss shall not be less than 70 db.
- (4) The relative insertion loss at 108.175 kc shall not be less than 39 db.
- (5) The relative insertion loss at 60.0 kc shall not be less than 25 db.

3.3.8.2 Through Supergroup Filter. - The through supergroup filter shall define the supergroup and suppress spurious frequencies outside the 312 to 552 kc band from the through supergroup connection. The through supergroup filter shall conform to the following:

a. Impedance. - The through supergroup filter impedance shall be 75 ohms unbalanced to ground. The return loss of the filter impedance at either terminal with the other terminal terminated in a resistive impedance of 75 ohms ± 1 percent shall not be less than 20 db at all frequencies in the range 312.3 to 551.875 kc.

b. Insertion Loss. - The insertion loss of the filter together with its associated equipment shall be 5 ± 0.5 db at 412 kc.

c. Pass Band Insertion Loss. - Except as modified in paragraph 3.3.8.2d, the spread of the insertion loss versus frequency characteristic over the range 312.3 kc to 551.875 kc shall not exceed 1 db. Over any 48 kc group, the spread shall not exceed 0.25 db.

d. Spurious Peaks of Insertion Loss. - Any peaks of insertion loss occurring in the filter pass band due to spurious responses of crystal resonators shall fall outside the limits of the nominal 4 kc channels. Such peaks shall not be included when determining the insertion loss versus frequency characteristics over the range 312.3 to 551.875 kc.

e. Stop Band Characteristic. - The insertion loss of the filter relative to the insertion loss at 412 kc shall not be less than 69.5 db at frequencies less than 304.0 kc or greater than 560.3 kc.

3.3.8.3 Frequency Response of Through Groups. - The frequency response of the ensemble of equipment involved in through group operation at a station (i.e., two group translating equipments, two supergroup translating equipments, one group pilot regulator, and one through group filter) shall be flat to within 1.5 db over the frequency range 60.6 to 107.7 kc (except for the permitted spurious response of paragraph 3.3.8.1c). Over the frequency ranges 60.6 to 63.7 kc and 104.6 to 107.7 kc the variation in response shall not exceed 1.2 db. Over the frequency ranges 64.6 to 67.7 kc and 100.6 to 103.7 kc, the variation in response shall not exceed 0.8 db. Over the following frequency ranges the variation in response shall not exceed 0.5 db:

68.6 - 71.7 kc	84.6 - 87.7 kc
72.6 - 75.7 kc	88.6 - 91.7 kc
76.6 - 79.7 kc	92.6 - 95.7 kc
80.6 - 83.7 kc	96.6 - 99.7 kc

The insertion loss at 60.175 kc shall not exceed the insertion loss at 63.0 kc by more than 1.7 db. The frequencies stated are in the basic 60 - 108 kc group band and are understood to be the frequencies at the group distribution frame. This requirement refers to response from multiplex and multiplex band with input signal supplied at constant voltage and with output voltage measured across a 75 ohm terminating resistor.

3.3.9 GROUP PILOT REGULATION AND MONITORING. - Where through group working is used, or when otherwise specified in ICS-61-SPEC-100, group pilot regulation shall be provided to maintain the transmission level of the group within the required limits. Where group monitoring is required by the system specification, means shall be provided for indicating the continuity of the group between group access frames. The group regulating and monitoring pilot signals, the group pilot regulator and the group monitoring receiver shall conform to the following:

3.3.9.1 Group Regulating Pilot. - This pilot, also known as the group reference pilot, shall be inserted in the channel translating equipment at the point where the 12 channels are combined to form the basic 60 to 108 kc group.

- a. Frequency. - The frequency used shall be 84.080 kc.
- b. Frequency Accuracy. - An initial frequency accuracy of ± 3 parts in 10^6 of 84.080 kc shall be required.
- c. Permissible Drift. - The drift of the pilot supply frequency shall not exceed 1.5 parts in 10^6 per month.
- d. Purity. - The ratio of the level of the pilot frequency signal to the level of any spurious signal distributed with the pilot signal shall not be less than 60 db except that the ratio of levels of $F \pm 50$ cps, $F \pm 60$ cps, $F \pm 100$ cps, and $F \pm 120$ cps shall be greater than 40 db, where F is the pilot frequency.
- e. Pilot Injection Level. - The level at which the pilot is injected into the system shall be -20 dbm0.

f. Common Pilot Supply. - The supply source of pilot signal shall be common to all channel translating equipments at a station. Two such supplies shall be provided at each station, one of which is normally operating and the other available as a "hot standby". Means shall be provided for automatic transfer to the standby supply in the event of failure of the operating supply. Operation of the automatic transfer circuit shall energize an audible and visual alarm. This alarm shall be capable of extension to a remote alarm console via a set of dry "Form C" (break-make) contacts.

g. Pilot Distribution. - The distribution circuits connecting the common pilot supply with the channel translating equipments shall be so designed that failure of one or more distribution circuits by open or short circuit will not cause the pilot level distributed to the remaining channel translating equipments to vary by more than 0.1 db. The distribution circuits shall also be so designed that the crosstalk coupling loss between channel translating equipments connected to the distribution circuits is not less than 80 db.

3.3.9.2 Group Pilot Regulator. - The group pilot regulator shall be connected at the -8 dbr point following the group demodulator at all stations where automatic level regulation of the group is required. The regulator circuit shall conform to the following requirements:

a. Frequency. - The regulator shall operate with the group regulating pilot (group reference pilot) specified in paragraph 3.3.9.1. The frequency shall be 84.080 kc.

b. Pilot Level. - The pilot regulator shall operate with an input level of -20 dbm0 at the pilot frequency.

c. Regulation Range and Control Ratio. - The term "control ratio" is defined as the ratio of any change in input pilot level measured in decibels to the resulting change in pilot output level also measured in decibels. Over a range of input pilot levels of ± 3 db about the nominal pilot input level, the pilot regulator shall provide a control ratio of not less than 10. At pilot input levels of ± 6 db, the control ratio shall be reduced to not more than 1.1. Within the above constraints, it is desired that the design of the pilot regulator provide as large a control ratio as is practicable over a range of input level variations of ± 4 db about the nominal input level.

d. Frequency Response. - The spread of the frequency response of the pilot regulator circuit over the range 60 to 108 kc exclusive of any group equalizer associated with the regulator shall not exceed 0.25 db. This limit shall be met for all values of pilot input level within the specified range of regulation.

e. Return to Nominal Insertion Gain. - Loss of input pilot signal shall cause the regulator circuit to assume its nominal insertion gain.

f. Alarms. - The pilot regulator circuit shall be equipped with audible and visual alarm circuits which will be activated upon failure of the input pilot frequency or upon departure of the pilot level at the output of the regulator by more than ± 2 db from its regulated value. The visual alarm shall be activated immediately

upon detection of the alarm condition. The audible alarm shall be activated only after the visual alarm has been displayed for more than five seconds. The audible alarm circuit shall be provided with a set of dry Form C (break-make) contacts for extension of the alarm to a remote alarm display console.

g. Regulation System Stability. - The pilot regulation system shall be so designed as to permit the tandem operation of up to five regulating sections in tandem without incurring instability of the group levels. The frequency selectivity of the pilot receiver and the response time of the pilot regulator shall be so proportioned as to minimize the interference to the regulator due to voice or modulation products, signaling tones, carrier leaks, noise hits, or other spurious signals.

h. Test Point. - The pilot regulator shall be equipped with a test point connected to the regulator output at which the output pilot signal appears at a level of -52 dbm.

i. Gain Stability. - With variations in the power supply voltage to the pilot regulator of ± 5 percent, the variation in insertion gain of the pilot regulator shall not exceed 0.1 db.

j. Intermodulation Distortion. - The linearity of the pilot regulator transfer characteristic shall be such that when two signals having frequencies A and B between 60 and 108 kc are present in the output of the pilot regulator at levels of -8 dbm (0 dbm0) for each signal, the intermodulation products specified below shall not be present in the output signal at levels greater than those specified. For intermodulation products having frequencies $A \pm B$, the level of any intermodulation product shall be less than the level of either the A or B excitation signal by a factor of at least 55 db. For intermodulation products having frequencies $2A \pm B$ and $2B \pm A$, the level of any intermodulation product shall be less than the level of either the A or B excitation signal by a factor of at least 70 db.

3.3.9.3 Group Monitoring Pilot. - When group monitoring is required by Specification ICS-61-SPEC-100 for monitoring the continuity of a group, the pilot signal used shall be injected at the input of the group modulator. The pilot signal shall conform to the following requirements:

a. Frequency. - The frequency used shall be 60 kc derived from the master carrier oscillator.

b. Pilot Injection Level. - The pilot signal shall be injected at a level of -20 dbm0.

c. Purity. - The ratio of the level of the pilot frequency signal to the level of any spurious signal distributed with the pilot signal shall not be less than 60 db except that the ratio of F to $F \pm 50$ cps, $F \pm 60$ cps, $F \pm 100$ cps, and $F \pm 120$ cps shall be greater than 40 db, where F is the pilot frequency.

d. Common Pilot Supply. - The supply source of pilot signal shall be common to all group translating equipments monitored at a station. Two such supplies shall be provided at each station, one of which is normally operating and the other available as a "hot standby". Means shall be provided for automatic transfer from the

operating supply to the standby supply in the event of failure of the operating supply. Operation of the automatic transfer circuit shall energize an audible and visual alarm. This alarm shall be capable of extension to a remote location using a set of dry Form C (break-make) contacts.

e. Pilot Distribution. - The distribution circuits connecting the common pilot supply with the group translating equipments shall be so designed that failure of one or more distribution circuits by open or short circuit will not cause the pilot level distributed to the remaining group translating equipments to vary by more than 0.1 db. The distribution circuits shall also be so designed that the crosstalk coupling loss between group translating equipments connected to the distribution circuits is not less than 80 db.

3.3.9.4 Group Monitoring Receiver. - The group monitoring receiver shall be connected at the output of the group demodulator to be monitored. The group monitoring receiver shall conform to the following:

a. Frequency. - The frequency shall be 60 kc.

b. Level. - The normal input level shall be -20 dbm0.

c. Selectivity. - The selectivity of the group monitoring receiver shall be such as to prevent substantial interference from signals having frequencies lower than 59.9 kc or greater than 60.1 kc.

d. Monitoring Operation. - The group monitoring receiver shall provide a visual alarm whenever the received pilot level departs from its alignment value by more than ± 2 db. An audible alarm shall be energized after the visual alarm has been displayed for more than five seconds. Means shall be provided for extension of the audible alarm to a remote location via a set of dry Form C (break-make) contacts. An additional output shall be provided in the form of dry Form C contacts operated together with the visual alarm to provide input for future automatic group restoral switching equipment.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-110
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
CARRIER TELEGRAPH MULTIPLEX EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-110, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS ALTERNATIVES AND PROCEDURES. - Delete the text and substitute the following:

In the event of conflict between this and any referenced specification except ICS-61-SPEC-100, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

PARAGRAPH 3.4.1 SYSTEM. - In item a. in the second sentence between the words "loop" and "shall", insert the following: "shall have an internal resistance not exceeding 500 ohms and". Also, change " \neq 80 volts" to " \neq 60 volts" and change "4000 ohms" to "3000 ohms".

In item b., add the following to the last sentence: "for all except the three lowest frequency channels which may have a peak distortion of up to 20 percent."

Add the following new subparagraph:

c. With the transmit and receive terminals connected back to back and initially adjusted for zero bias distortion at 75 bauds, the introduction of a + or - two cps frequency error by the transmit oscillator shall result in a bias change at the receiver output not exceeding 3%.

PARAGRAPH 3.4.2.1 NUMBER OF CHANNELS. - Insert between "for" and "24" the words "a maximum of". Add the following sentence:

The exact number of channels to be provided shall be as specified by the procuring agency.

PARAGRAPH 3.4.2.7 TRANSMITTER INPUTS. - Add the following sentence:

Means shall be provided for measuring and adjusting the send loop current. The metering circuit may be common to a group of transmitters at the same location.

PARAGRAPH 3.4.3.6 RECEIVER OUTPUTS. - Add the following second sentence to this paragraph:

Means shall be provided for measuring and adjusting the receive loop current. The metering circuit may be common to a group of receivers at the same location.

Add the following new paragraphs:

3.4.3.7 Receiver Bias Control. - Each receiver shall be equipped with a bias adjustment control suitable for effecting a bias compensation of at least \pm 10 percent at 100 words per minute. A suitable meter shall be provided with the receiving equipment to facilitate bias adjustment. This meter may be furnished with each receiver or it may be common to all receivers at a given location.

3.4.3.8 Transmit Loop Bias Indicator. - Means shall be provided for measuring the bias distortion of all send loops. The measuring circuitry may be common with that used for measuring receive bias (paragraph 3.4.3.7).

PARAGRAPH 3.4.4 REGENERATIVE REPEATER. - Delete this paragraph and all paragraphs subordinate to it in their entirety.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-111
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
ORDER WIRE AND PILOT TONE EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-111, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS ALTERNATIVES AND PROCEDURES. -
Delete the text and substitute the following:

In the event of conflict between this and any referenced military specification, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-112
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
LOCAL AND REMOTE MONITORING EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-112, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATIONS, ALTERNATIVES AND PROCEDURES. - Delete the text and substitute the following:

In the event of conflict between this and any referenced specification, the order of precedence shall conform to the following sequence: ICS-61-SPEC-100, ICS-61-SPEC-111, ICS-61-SPEC-112, ICS-61-SPEC-110, all other referenced specifications.

PARAGRAPH 3.3.1.1 FUNCTIONAL PERFORMANCE. - Between "telephone sets" and "of the local" insert the following: "and their associated signaling circuit controls and indicators."

PARAGRAPH 3.3.1.2.2 DISPLAY. - In the fifth line insert the word "momentary" before the word "key". Change "device" to "non-locking devices".

ITT COMMUNICATION SYSTEMS, INC.

Amendment 1
ICS-61-SPEC-114
1 February 1962

AMENDMENT 1
PERFORMANCE SPECIFICATION
POWER GENERATION AND DISTRIBUTION
EQUIPMENT

This amendment forms a part of Specification ICS-61-SPEC-114, dated 8 December 1961. The changes specified herein are effective upon receipt.

PARAGRAPH 2.2 PRECEDENCE OF SPECIFICATION ALTERNATIVES AND PROCEDURES. -
Delete the last sentence and substitute the following:

In the event of conflict between this specification and any other referenced specification other than ICS-61-SPEC-100, this specification shall govern. In the event of conflict between this specification and ICS-61-SPEC-100, the latter shall govern.

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